The Canadian Entomologist

VOL. LVI. ORILLIA, APRIL, 1924. No. 4.

THE OCCURRENCE OF THE PTINID BEETLE, NIPTUS HOLOLEUCUS FALD, IN NORTH AMERICA

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In March, 1923, I received from a correspondent in London, Ont., several specimens of a ptinid beetle, apparently of the genus *Mezium*, with the statement that they were being found in numbers in consignments of imported woollen goods, such as gloves, mufflers, underwear, etc. Very little damage was being effected but there was nevertheless definite indication of injury. At the time I associated the specimens submitted with the European species *Niptus hololeucus* Fald., and was reminded of an infestation of this latter insect which occurred in Montreal, Que., a number of years ago. Since, too, I have examined the specimens of Ptinidae in the National Collection of Insects and have been much surprised to find a single specimen of *Niptus hololeucus* Fald., bearing the label "Halifax, N.S., 1899". Dr. Swaine, who is interested in ptinid beetles, has confirmed this determination.

In looking through our records I find that the specimens from Montreal were received at Ottawa in November, 1904. They had been forwarded by the late Henry H. Lyman, of Montreal, who in turn had received them from a householder in that city. In the following year the late Dr. Fletcher investigated the infestation in Montreal and found that the beetles were present in numbers in the cellar of the house,—a large rambling basement with several rooms opening into each other. The householder stated that the beetles were found at all times of the year, and at the time of Dr. Fletcher's visit the insects were being destroyed "every night—from 100 to 150 a night". The beetles apparently caused no noticeable injury to any thing in the house, being complained of particularly on account of their abundance and their habit of getting into things. The only food which was noticed as having been eaten by the beetles was a dead wood louse. A brief reference to this infestation was made by Dr. E. A. Schwarz, before a meeting of the Entomological Society of Washington, held on December 1, 1904[1], and it is also referred to by Mr. H. C. Fall in his Revision of the Ptinidae of North America[2]. This occurrence at Montreal was the first record we had for North America until the finding of the specimen mentioned above from Halifax, N.S., taken in 1899.

Dr. E. A. Schwarz, of Washington, D.C., recently informed me[3] that since the publication of Leng's Catalogue of North American Coleoptera, in which "Canada" is given as the locality reference and which refers to Fletcher's Montreal specimens, he has determined for Mr. C. W. Johnson, two specimens of *Niptus hololeucus*, one labeled "Boston, Mass., XI, 9, 1920", and the other "Boston XII, 27, 1920". Mr. H. C. Fall also determined the species and a note of the occurrence was published in *Psyche*, XXVIII, 7. This occurrence at Boston, Mass., is the only one in the United States that I have heard of. There are now, there-

1.—Proc. Ent. Soc. Washington, VII, 23, 1905.
2.—Trans. Amer. Ent. Soc. XXXI, 108, 1905.
3.—In litt. Oct. 27, 1923.

fore, three records of the insect having been found in North America, namely, Halifax, 1899, Montreal, 1904 and 1905, and Boston, 1920.[4]

Old World Distribution

In a manuscript note Fletcher stated that he had found the beetle in England about the year 1869, the infestation being in a single room at the top of a very old house. Its strange shape and beautiful old gold color and satiny sheen especially attracted his attention.

Riley[5] (1883) reports that specimens of *Niptus hololeucus* were received by Lord Walsingham from Scotland with the statement that the insect was said to have damaged silver plate, there being holes in the plate on which the insects were found. The corrosive property probably existed in the foeces".

Schwarz[6] (1896) stated that the insect was "probably a native of Asia Minor, whence it was imported into Great Britain about sixty years ago. (This would be about 1836.) It occurs now at many points in western and central Europe, not only living in all sorts of spices and drugs but also proving to be injurious in various ways. It would be a most undesirable addition to our fauna."

Ealand[7] (1915) states "*Niptus* is peculiar in having no wings and fused wing-cases; it obtains its nourishment from various household provisions and is said to have been introduced into this country (England) in Turkish carpets."

Macdougall[8] (1916) reports that *Niptus hololeucus* is common in houses in Scotland. It is recorded by him as feeding on casein. "It may be found among old wood, cupboards, drawers, and may be said to be a general feeder."

Tullgren[9] (1916) reported injury in Sweden to grain, etc.

Frickinger[10] (1921) states that during recent years there has been a marked increase of the insect in Bavaria, Wurtemberg and Switzerland. In houses its numbers have rendered rooms uninhabitable. Much damage is done to chocolate factories and in wool and leather stores. Fumigation with hydrocyanic acid gas is the best remedy; other measures are the use of pyrethrum insect powder and trapping in clothes damped so as to attract the beetles. (Abstract in The Review of Applied Entomology, Series A, XI, 242, 1923.)

In the letter referred to above from Dr. Schwarz, the following paragraph appears:

"In the more recent European literature I came across the following note which may be of interest to you (I have translated it from the French):

"*Niptus hololeucus* first found by Falderman in 1835 in Asia Minor, was found in 1838 for the first time in London. In 1840 it occurred at Dresden in rhubarb roots. In 1844 it made its appearance in Wurtemburg. The Rhine formed for a long time a barrier for westward spread, and it was unknown in Alsace until about 1910; but in 1920 it was common in Strassburg in many houses and swarmed during the war in a hospital (1917)." (P. Scherdlin, 1920, 2nd

4.—Since the above was written, Mr. C. W. Johnson has informed me that he received 15 specimens of *Niptus hololeucus* from Dr. J. Payson Clark, collected in his house in Boston between Oct. 15 and Nov. 1, 1923.
5.—Amer. Nat. XVII, 420, 1883.
6.—Can. Ent. XXVIII, 178, 1896.
7.—"Insects and Man," by C. A. Ealand, London, Eng. (Grant Richards Ltd.), 1915, p. 268.
8.—R. S. Macdougall, Trans. Highland and Agric. Soc. of Scot. XXVIII, 137, 1916.
9.—A. Tullgren, Scadedjur i Sverige Aren, 1912-1916.
10.—Die Umschau XXV, 47-49, 1921.

Supplem, Catalogue der Coleopteres de la Chaine des Vosges et des Regions limitrophes, Colmar, 1920, p. 152-153.)

DESCRIPTION.

The adult beetle is from 3 to 4 mm. in length and of a satiny gold color. It is in general similar in shape to the well known spider beetle, *Ptinus fur* which is also a household pest. Macdougall in the article referred to says that fresh specimens of *Niptus hololeucus* look "yellow or yellow-brown in color, owing to the body being covered with a silky scale-like pubescence amid which longer hairs stand up. If the pubescence is rubbed off the beetle is seen to be dark colored. The beetle is wingless."

PRODROMUS OF ANDRENA, A GENUS OF BEES

BY HENRY LORENZ VIERECK,
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(Continued from page 32.)

Andrena (Andrena) diversicolor n. sp.

Related to *A.* (*A.*) *clarkella* Kby.

Female. Length 11 mm.; body black, mostly covered with black or blackish hairs; head mostly covered with black or blackish hairs, fovea filled with blackish hairs, vertex and upper part of occiput only with ochreous hairs, face mostly shining, indistinctly reticulate, with distinct punctures that are mostly only one or two puncture widths apart, clypeus slightly elevated above the apical margin, convex, sculptured much like the face except that the punctures are larger and better defined, clypearea present, welt-like but poorly defined, clypeus densely hairy, its sculpture nearly hidden by hairs, labrarea narrowly rounded at apex, labrum with a median longitudinal crista, antennae blackish thoughout, mandibles typical, robust, palpi nearly typical; thorax above, including tubercles and upper edge of mesopleura covered with an abundance of pale ochreous to tawny hairs that are apparently shorter on the dorsulum than the hairs on the mesopleura, mesopleura mostly with blackish hairs, scutel hairy and sculptured much like the dorsulum, legs blackish except for the joints of the tarsi which are more or less reddish, covered with blackish hairs except as follows, trochanteric floccus with some blackish hairs at base, otherwise whitish, hind femora with whitish hairs except at apex where the hairs are blackish, scopa atypical, compact, with long whitish hairs on the lower half and short blackish hairs on the upper half; propodeum poorly defined, dullish and finely reticulated, rest of upper face of propodeum covered with fine pale tawny hair; abdomen with its tergum shining, first and second tergites covered with erect pale ochreous hair, third tergite with erect pale ochreous and black hairs, fourth and fifth tergites with erect black hairs, apical edge of first, second, third and fourth tergites with a translucent brownish border, pygidium with a planate margin and a median embossed area, pygidium truncate at apex, fimbria blackish.

Holotype—♀, Banff, Alta., April 15, 1911 (N. B. Sanson); No. 658, in the Canadian National Collection, Ottawa.

Paratype—♀, May 1, 1911, otherwise with the same data as the holotype.

Andrena (Andrena) excellens n. sp.

Related to *A.* (*A.*) *harveyi* Vier.

Female. Length 10 mm.; body black, partly covered with reddish hairs;

head covered with black hairs except for an admixture of ochreous hairs on the face, clypeus and occiput, fovea filled with blackish hairs, face mostly shining, partly indistinctly reticulate, with distinct punctures that are mostly not more than three puncture widths apart, clypeus elevated above the apical margin, convex, sculptured along its edge like the face except that the punctures are larger and sparser, clypearea present and partly polished like the adjoining portions of the clypeus, clypeus thinly hairy, its sculpture not at all hidden by hairs, labrarea shallowly emarginate, labrum with an elevation between the labrarea and apical edge of labrum, antennae blackish throughout, mandibles typical, robust, palpi nearly typical; thorax covered above and nearly half way down on the pleura with an abundance of reddish hairs, that are shorter on the dorsulum than the mostly black hairs on the lower half of the mesopleura, scutel hairy and sculptured much like the dorsulum, legs blackish except for the sutures of the tarsi and claws which are more or less reddish, covered with ochreous hairs on the coxae, with ochreous and blackish hairs on the trochanters and femora, and with blackish hairs on the tibiae and tarsi except as follows, trochanteric floccus almost whitish, scopa with its hairs of the lower third pale ochreous, of its upper two-thirds blackish; propodeum with its enclosure poorly defined, dullish and finely reticulated, rest of upper face of propodeum covered with fine reddish hair; abdomen with its tergum shining, first, second, third and fourth tergites with a translucent brownish border, pygidium truncate, nearly planate, with a polished border, the median embossed finely reticulated area leveled toward the end, fimbria blackish.

Holotype— ♀, Vancouver, B.C., May 1, 1921 (F. W. L. Sladen); No. 663, in the Canadian National Collection, Ottawa.

Andrena (Andrena) magnifica n. sp.

Related to *A.* (*A.*) *milwaukeensis* Graen.

Female. Length 12 mm.; body black, mostly covered with black hairs; head covered with black hairs, fovea filled with blackish hairs, upper edge of vertex and of occiput with reddish hairs, face shining, partly indistinctly reticulate, with distinct punctures that are mostly not more than two puncture widths apart, clypeus elevated above the apical margin, convex, with distinct adjoining or nearly adjoining punctures except down the middle, clypearea present, polished, clypeus rather thinly hairy, its sculpture hardly hidden by hairs, labrarea subemarginate, antennae blackish, beyond the third joint brownish, mandibles typical, robust, palpi nearly typical; thorax above covered with an abundance of pale reddish hairs which are shorter on the dorsulsum than the black hairs on the mesopleura, scutel hairy and scultpured much like the dorsulum, legs blackish except for the tarsi which are more or less brownish, covered with blackish hairs, scopa typical, its hairs blackish throughout; propodeum with its enclosure poorly defined, dullish and finely reticulated, rest of upper face of propodeum covered with finer pale reddish hair than scutel; abdomen with its tergum shining, first tergite except at base and on sides and second and third except at sides, with reddish erect hairs, fourth tergite with a median patch of erect reddish hairs, apical edge of first, second, third and fourth tergites with a brownish border, pygidium nearly planate, not furrowed on each side, nearly pointed at apex, fimbria blackish.

Holotype— ♀, Rockcreek, B.C., April 22, 1919, (E. R. Buckell); No. 664,

in the Canadian National Collection, Ottawa.

Andrena (Andrena) nitidarum n. sp.

Related to *A.* (*A.*) *thaspii* Graen.

Female. Length 11 mm.; body black, mostly covered with ochreous hairs; head covered with ochreous hairs, except around the eyes and at the junction of the cheeks and the vertex where the hairs are more or less dark or blackish, upper half of fovea with brownish hairs, the lower half mostly with ochreous hairs, face shining, partly indistinctly reticulate, with distinct punctures that are mostly not more than three puncture widths apart, clypeus slightly elevated above the apical margin, convex, along its edge sculptured like the face, elsewhere polished or nearly so, clypearea present and well defined, polishd, clypeus thinly hairy, its sculpture not at all hidden by hairs, labrarea subemarginate when seen from in front, but seen from below it is triangularly emarginate, labrum with a median longitudinal raised line between the labrarea and apical edge of labrum, antennae brownish except for the first, second and third joints which are blackish throughout, mandibles typical, robust, palpi nearly typical; thorax covered with an abundance of pale ochreous hairs that are shorter on the dorsulum than the hairs on the mesopleura, scutel hairy and sculptured much like the dorsulum, legs blackish except for the small joints of the tarsi, which are more or less reddish, covered with brownish golden and ochreous hairs, scopa typical, its hairs ochreous, hairs at base above not decidedly darkened; propodeum with its enclosure poorly defined, dullish and finely reticulated, rest of upper face of propodeum covered with finer pale ochreous hair than the mesopleura; abdomen with its tergum shinging, second, third, and fourth tergites with broad thin fasciae of ochreous appressed hairs, apical edge of first, second, third and fourth tergites with a stramineous edge, pygidium nearly planate laterally, medially with a rather poorly defined embossed area, truncate at apex, tergum with inconspicuous, ochreous erect hairs in addition to the hair bands, fimbria pale golden or ochreous.

Holotype—♀, Calgary, Alta., July 18, 1917, (F. W. L. Sladen); No. 673, in the Canadian National Collection.

Paratypes—2 ♀, same data as the type; 1 ♀, Waterton Lake, Alta., June 22, 1923, (J. McDunnough) and another from Banff, Alta, June 22, 1912 (Sanson). One of the paratopotypes is appreciably smaller than the type. On most of the specimens there are present the shot-like grains of some *Geranium* species of which Dr. McDunnough tells me there was an abundance of flowers in Waterton Lake when the paratype from that place was collected.

Andrena (Andrena) pallida n. sp.

Related to *A.* (*A.*) *moesta* Smith.

Female. Length 11 mm.; body black, mostly covered with ochreous hairs; head covered with ochreous and black hairs, fovea filled with dark seal brown or blackish hairs, vertex, front and temples along the upper edge of the eye with black hairs, face mostly shining, indistinctly reticulate, with distinct punctures that are as many as four puncture widths apart, clypeus hardly elevated above the apical margin, convex, sculptured like the face except that the punctures are closer and better defined, clypearea represented by a polished more sparsely punctured area, clypeus thickly hairy, its sculpture nearly hidden by hairs, labrarea

rounded, labrum with a median longitudinal welt between the labrarea and apical edge of labrum, antennae brownish except for the blackish first, second and third joints, mandibles typical, robust, palpi nearly typical; thorax covered with an abundance of ochreous hairs which are shorter on the dorsulum than the concolorous hairs on the mesopleura, scutel hairy and sculptured much like the dorsulum, legs blackish except for the small joints of the tarsi, which are more or less reddish brown, covered with brownish golden and ochreous hairs, scopa typical, its hairs of the lower third pale ochreous, of its upper two thirds with a brownish hue, hairs at base above decidedly darkened; propodeum with its enclosure poorly defined, dullish and finely reticulated, rest of upper face of propodeum covered with finer pale ochreous hair than on the mesopleura; abdomen with its tergum shining and covered with erect ochreous hairs except on the sides of the third and fourth tergites and all over on the fifth where blackish hairs predominate, tergites with a stramineous border, pygidium nearly planate, nearly pointed at apex, fimbria dark seal brown.

Holotype—♀, Banff, Alta., May 19, 1910 (N. B. Sanson); No. 683, in the Canadian National Collection, Ottawa.

Andrena (Andrena) potentillarum n. sp.

Related to *A.* (*A.*) *perindotata* Vier.

Female. Length 10 mm.; body black, mostly covered with pale ochreous almost white hairs; head covered with white hairs except across the front and around the eyes where there are some dark and black hairs and on the anterior half of the clypeus where there are some dark hairs, fovea filled with dark seal brown hairs in its upper half and pale hairs in its lower half, vertex with whitish hairs, face shining, partly indistinctly reticulate, with distinct punctures that are mostly not more than three puncture widths apart, clypeus slightly elevated above the apical margin, convex, sculptured like the face except that the punctures are larger and closer, clypearea present, well defined, shiny, finely sculptured, clypeus thinly hairy, its sculpture not at all hidden by hairs, labrarea triangularly emarginate, labrum with a slight median longitudinal welt between the labrarea and apical edge of labrum, antennae brownish except for the first three joints which are blackish, mandibles atypical, robust, palpi nearly typical; thorax covered with an abundance of pale ochreous almost white hairs that are shorter on the dorsulum than the mixed whitish and black hairs on the mesopleura, scutel hairy and sculptured much like the dorsulum, legs blackish except for the tips of the metatarsi and the small joints of the tarsi that are reddish, covered with brownish golden hairs except the fore coxae, trochanters and femora and the hind trochanters and femora, which are mostly covered with whitish hairs, scopa atypical, almost velvety with dark brownish hairs; propodeum with its enclosure poorly defined, dullish and finely reticulated, rest of upper face of propodeum covered with finer whitish hair than mesopleura; abdomen with its tergum shining, nearly bare, not banded, apical edge of first, second, third and fourth tergites with a succineous border, pygidium nearly planate, nearly pointed at apex, tergum with inconspicuous, pale nearly appressed hairs, except on the first tergite, where the hairs are plentiful and nearly erect, femora brownish.

Holotype—♀, Calgary, Alta., July 29, 1916, at flowers of *Potentilla fruticosa* (F. W. L. Sladen); No. 671, in the Canadian National Collection.

Paratypes—2♀, with the same data as the holotype, one stylopized. In

two paratypes from Geneva, Grant Co., Colorado, alt. 10,000 ft., (E. C. Jackson), one has no black hairs on the mesopleura and the other has only a few black hairs there.

Andrena (Andrena) singularis n. sp.

Related to *A.* (*A.*) *edwardsi* Vier.

Female. Length 11 mm.; body black, mostly covered with pale ochreous hairs; head covered with dark or blackish and ochreous hairs, fovea filled throughout with dark seal brown hairs, vertex, front, temples along the upper edge of the eye, face along inner eye margin, cheeks and occiput with dark brown or black hairs, face mostly polished, partly indistinctly reticulate, with distinct punctures that are mostly not more than three puncture widths apart, clypeus distinctly elevated above the apical margin, convex, at base and laterally sculptured like the face, elsewhere mostly nearly polished and with larger punctures than the face, clypearea present but poorly defined, clypeus thinly hairy, its sculpture not at all hidden by hairs, labrarea seen from the front subemarginate, seen from beneath rounded emarginate, labrum with a median longitudinal welt between the labrarea and apical edge of labrum, antennae brownish except for the first, second and third joints, which are blackish throughout, mandibles typical, robust, palpi nearly typical; thorax covered with an abundance of ochreous hairs that are shorter on the dorsulum than the ochreous and blackish hairs on the mesopleura, mesopleura with blackish hairs on the anterior and posterior border, scutel hairy and sculptured much like the dorsulum, legs blackish except for the small joints of the tarsi which are more or less reddish, covered with brownish golden and pale ochreous hairs, sccpa typical, its hairs of the lower third pale ochreous, of its upper two-thirds brownish, hairs at base above blackish; propodeum with its enclosure poorly defined; dullish and finely reticulated, rest of upper face of propodeum covered with finer pale ochreous hair than mesopleura; abdomen with its tergum shining, nearly bare, the first and second tergites with erect whitish hairs, apical edge of first, second, third and fourth tergites with a brownish border, pygidium planate, nearly pointed at apex, tergum with inconspicuous, blackish hairs on the tergites beyond the second, fimbria dark seal brown.

Holotype—♀, Invermere, B.C., May 19, 1915, (F. W. L. Sladen), No. 674, in the Canadian National Collection.

Paratypes with the same data as the type, another paratype as follows, Goldstream, B.C., July 27, 1902.

Andrena (Andrena) vancouverensis n. sp.

Superficially this has characters in common with *A.* (*A.*) *vicina* Sm., but the hypopygium is of the *A.* (*A.*) *agricolarum* V. and C. type.

Male. Length 8 mm.; body black, mostly covered with ochreous hair; temples rounded, head covered with ochreous hairs except along the inner, outer and upper eye margin and on most of the front, where the hairs are black, clypeus convex, polished, more distinctly punctured than the face, clypearea wanting, sculpture of the clypeus not hidden by the moustache, labrarea subemarginate, almost truncate, polished, joint 3 of antennae: 4::8:5, flagel almost straight in outline, antennae brownish excepting the first, second and third joints, which are blackish, extending a little beyond the outer edge of the labrum, palpi nearly typical; thorax covered with an abundance of dark, dull, ochreous hairs,

hairs of dorsulum seemingly shorter than hair of mesopleura, dorsulum dullish, mesopleura with dark ochreous hairs throughout, scutel hairy and sculptured like the dorsulum, membrane uniformly tinged with brown, legs blackish brown excepting the small joints of the tarsi which are rather reddish-brown, legs covered with an abundance of dark, dull ochreous hairs, hairs of dorsulum seemingly shorter than hair of mesopleura, dorsulum dullish, mesopleura with dark ochreous hairs throughout, scutel hairy and sculptured like the dorsulum, metanotum hairy like the dorsulum, membrane uniformly tinged with brown, legs blackish brown excepting the small joints of the tarsi which are rather reddish brown, legs covered with ochreous hairs; propodeum with its enclosure poorly defined, with irregular rugae on basal half, finely reticulated on apical half, rounded off at apex, rest of upper face with dark ochreous hair, propodeal pleura not nearly hidden by the uniformly distributed ochreous hairs; abdomen with its tergum shining, almost polished, finely reticulated and indistinctly punctured, nearly bare, tergum with rather inconspicuous appressed dark hairs in addition to the pale ochreous erect hairs on the sides of the first and second tergites, hair at apex of abdomen of a brownish golden hue, emargination of the seventh sternite describing a right angled triangle in outline.

Holotype—♂, Vancouver, B.C., Apr. 10, 1904, (R. V. Harvey); No. 694 in the Canadian National Collection, Ottawa.

Paratype—With the same data as the holotype.

Andrena (Andrena) varia n. sp.

Related to *A.* (*A.*) *buckelli* Vier.

Female. Length 11 mm.; body black, mostly covered with ochreous or tawny hairs; head covered with ochreous hairs, except on vertex, across the front and around the eye margin where the hairs are black, fovea filled with dark seal brown, almost blackish hairs, face mostly shining, partly indistinctly reticulate, with distinct punctures that are mostly two or three puncture widths apart, clypeus slightly elevated above the apical margin, convex, sculptured like the face except that the punctures are closer, clypearea wanting, clypeus densely hairy its sculpture nearly hidden by hairs, labrarea narrowly truncate, labrum with a median longitudinal welt between the labrarea and apical edge of labrum, antennae blackish throughout, mandibles typical, robust, palpi nearly typical; thorax above and half way down on the pleura covered with an abundance of reddish hairs that are shorter on the dorsulum where they are darker than on the mesopleura, lower half of mesopleura with ochreous hairs, scutel hairy and sculptured much like the dorsulum, legs blackish except for the joints of the tarsi which are more or less translucent reddish, covered with rather ochreous hairs, except on the tibiae and tarsi where most of the hairs are dark brownish, scopa typical, its hairs of the lower third pale ochreous, of its upper two-thirds blackish; propodeum with its enclosure poorly defined, dullish and finely reticulated, finely wrinkled at base, rest of upper face of propodeum covered with fine, tawny hair; abdomen with its tergum shining, first, second, third and fourth tergites covered all over with erect, long, ochreous hair, apical edge of first, second, third and fourth tergites with a translucent brownish border, pygidium with a planate border and a median triangular embossed area, pygidium rounded at apex, fimbria blackish.

Holotype—♀, Chilcotin, B.C., April 29, 1920 (E. R. Buckell); No. 662, in the Canadian National Collection, Ottawa.

(To be Continued)

THYSANOPTERA KNOWN TO OCCUR IN CANADA*

BY R. C. TREHERNE,

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A Key to the subfamilies and higher groups of the Order Thysanoptera is ably presented by Mr. J. Douglas Hood in the Proceedings of the Biological Society of Washington, Vol. 28, pp. 53-60, March, 1915. It is pointed out in this publication that the Order, which is Orthopteroid in character, contains two main sub-orders, namely: *Terebrantia* Haliday (1836) and *Tubulifera* Haliday (1836) and four superfamilies, namely: *Aeolothripoidea* Hood (1915), *Thripoidea* Hood (1915), *Phloethripoidea* Hood (1915) and *Urothripoidea* Hood (1915). Attention is also drawn to the belief that the *Aeolothripoidea* is the most generalized superfamily, with at least 58 recognized species present in the Tertiary geological period as compared to the superfamily *Phloeothripoidea* which is considered the most highly specialized and represented in the Tertiary period by only two described species. The order of presentation of the list of species known to Canada will therefore be constructed on the principle of phylogenetic development based on the interpretation laid down by Hood.

Family AEOLOTHRIPIDAE Uzel (1895)

Subfamily OROTHRIPINAE Bagnall (1913)

Orothrips kelloggi yosemiti Moulton. Off *Amelanchier*, June-July, 1917 (R. C. Treherne); Lillooet, B. C.

**Aeolothrips conjunctus* Priesner. *Ae. annectans* Hood was described in June, 1916, from some specimens taken in Maryland, Virginia and New York States, U.S.A., in 1913 and 1915. In June, 1916, some specimens were taken from the bloom of *Ulex europaeus* at Royal Oak, Vancouver Island, B. C., by the author. A manuscript was prepared covering the description of what was considered a new species but Hood's manuscript appeared in time to prevent any publication. Through the kindness of Dr. H. Priesner, Linz, Austria, attention is drawn (in litt: VIII, 19, 1922) to the possibility that *Ae. annectans* was similar to his own species *Ae. conjunctus* Pr. Later Dr. Priesner forwarded a specimen of *Ae. conjunctus* for comparison with *Ae. annectans* and a specimen of *Ae. annectans* was likewise sent to Dr. Priesner for his information. As a result of both these comparisons Dr. Priesner and the author are of one mind that the insects are identical. *Ae. annectans* Hood thus is synonymous with *Ae. conjunctus* Pr. and sinks in favor of the latter name, which has priority.

Off *Ulex europaeus*, Royal Oak, Vancouver Island, B.C.; *Sambucus racemosa*, *Amelanchier florida*, apple, alder and in sweeping general vegetation at Vernon, B C.; *Ribes viscosissimum*, *Lithospermum pilosum* and onion at Kelowna, B.C, 1916-1918 (R. C. Treherne).

Aeolothrips auricestus Treherne. Off *Elymus condensatus*, Vernon, Kelowna, July, 1917-1919 (R. C. Treherne).

Aeolothrips fasciatus Linnaeus. Off a wide variety of plants at Victoria, Lillooet, Agassiz, Vernon, Kelowna, B. C.; Treesbank, Manitoba; Ottawa, Ontario, during May, June and July, 1916-1922 (R. C. Treherne); one brachyp-

*—Contribution from the Division of Field Crop and Garden Insects, Entomological Branch, Dept. of Agric., Ottawa.

terous female taken sweeping at Midday Valley, B.C., July 15, 1922 (N. L. Cutler); on onion, Vineland, Ontario (W. A. Ross); on dandelion and strawberry, Lethbridge, Alberta; off *Cicuta*, Waterton Lake, Alberta (H. L. Seamans).

Family THRIPIDAE Uzel (1895)

Chirothrips manicatus Haliday. Off common roadside grasses, Vernon, B.C., June, 1917 (R. C. Treherne); on pear, Beamsville, Ont., 1918 (W. A. Ross).

Heliothrips haemorrhoidalis Bouche. Off azalea in greenhouse, Montreal, P.Q., 1916 (J. I. Beaulne); off holly fern, Lachine, P.Q., (Jos. Bennett).

Heliothrips femoralis Reuter. On foliage of cinerarias, Vineland, Ont., 1914 (W. A. Ross).

**Sericothrips stanfordi* Moulton. Off roadside grasses, Victoria, B. C., May, 1918 (R. C. Treherne).

**Sericothrips variabilis* Beach. Off *Amelanchier florida*, Lillooet, B. C., July, 1917 (R. C. Treherne).

Apterothrips subreticulatus Bagnall. Off *Lupinus arcticus*, Lillooet, B. C., July, 1917 (R. C. Treherne); Masset, Queen Charlotte Islands, B.C., 1900 (J. H. Keene).

Parthenothrips dracaenae Heeger. Off *Ficus elastica*, Vancouver, B. C., September, 1922 (J. W. Eastham).

Ctenothrips bridwelli Franklin. Off *Lyschiton kamtschatcense*, Vernon, B.C., April, 1919 (R. C. Treherne).

Odontothrips ulicis Haliday. Shaken off *Salix* sp., Malahat, B.C., May 29, 1917 (R. C. Treherne).

Frankliniella tritici Fitch. On many kinds of plants from Victoria, Vancouver, Agassiz, Okanagan Valley, Lillooet, B. C.; Ottawa, Ontario, May to October (R. C. Treherne); off squash, Strathroy, Ontario (H. F. Hudson).

**Frankliniella occidentalis* Pergande. On many kinds of plants in coast and interior sections in British Columbia (R. C. Treherne); off broad beans, Vermilion, Alta., August, 1920 (E. H. Strickland); off alfalfa, Lethbridge, Alta., 1921-1922 (H. L. Seamans); off wild flowers, Treesbank, Manitoba, 1922 (R. C. Treherne).

Frankliniella moultoni Hood. Off apple, Vernon, Agassiz, B. C., 1915 (R. C. Treherne).

Frankliniella varicorne Bagnall. Off *Petalostemon purpureum*, Semans, Saskatchewan, August 4, 1917 (A. E. Cameron).

Frankliniella nervosa Uzel. Off wheat and oats, Ottawa, Ont., July, 1911 (C. G. Hewitt).

Taeniothrips inconsequens Uzel. Off fruit trees, maples and other plants, Saanich Peninsula, Duncan, B.C., March-May, 1916-1917 (A. E. Cameron, R. C. Treherne); on pear, Vineland, Beamsville, Ont., 1919-1920 (W. A. Ross).

**Taeniothrips albus* Moulton. Off *Amelanchier cusickii*, Kelowna, B.C., May, 1917 (R. C. Treherne).

**Taeniothrips pallipennis* Uzel. Off rhubarb at Vernon, B.C.; general vegetation, Lillooet, B.C., June, 1917 (R. C. Treherne); in flowers of wild plants, Treesbank, Man., May, 1922 (R. C. Treherne).

**Taeniothrips vulgatissimus* Haliday var. *meridionalis* Pr. Off bloom of cultivated rhubarb, Vernon, B.C., June 14, 1917 (R. C. Treherne).

Thrips physapus Linne. On bloom of dandelion and other plants at Victoria, Kelowna, Vernon, B.C.; off *Rubus parviflorus*, North Vancouver, B.C., April-June, 1916-1917 (R. C. Treherne).

Thrips tabaci Lindeman. On onion and other plants in Okanagan Valley, Agassiz, Victoria, B.C., 1916-1920 (R. C. Treherne); in a greenhouse, Lethbridge, Alta.; in greenhouse, Leamington, Ont., 1922 (R. C. Treherne); on rose, Barrie, Ont., 1919 (in litt: R. C. Treherne).

Anaphothrips (*Euthrips*) *cameroni* Bagnall. Off injured wheat stems, Seamans, Sask., August 4, 1917 (A. E. Cameron).

Anaphothrips obscurus Muller. On oats and wheat in May at Strathroy, Ontario, 1922 (H. F. Hudson); probably to be found at many points in Prairie Provinces, (R. C. Treherne); on oats and corn, Vineland, Ont., June-July, 1915 (W. A. Ross); from various provinces from Nova Scotia to British Columbia, 1911 (C. G. Hewitt).

Family PHLOEOTHRIPIDAE Uzel, 1895

Subfamily HAPLOTHRIPINAE Karny

Cephalothrips monilicornis Reuter. Shaken from tall rye grass, Vernon, B.C., June 16, 1917 (R. C. Treherne).

Haplothrips statices Haliday. From clover and apple bloom, Royal Oak, Penticton, Vernon, B.C., June-August, 1916-1917 (R. C. Treherne); on alsike clover and chrysanthemums, Vineland, Ont., (W. A. Ross).

Haplothrips verbasci Osborn. On *Verbascum thapsus*, Vineland, Ont., (W. A. Ross).

**Haplothrips leucanthemi* Schnk. On flowers of ox-eye daisy at Aylmer, P.Q., June 10, 1922 (R. C. Treherne).

Leptothrips mali Fitch. Off stems of plum, cherry, alder, apple, crataegus, peach, maple (*Acer glabrum*), Amelanchier at Vernon, Summerland, Penticton, Okanagan Falls, Vaseaux Lake, Lillooet, B.C., April-August, 1917-1918 (R. C. Treherne); on grape, Vineland, Ontario (W. A. Ross).

Frankliniella nubila n. sp.

This species is allied to *tenuicornis*. At first glance it appeared different from any species of American origin, except possibly *nervosa* Uzel as described by Hinds. On the possibility that this species had been recorded from Europe I took the liberty of addressing Dr. H. Priesner, Linz, Austria, with regard to the matter, submitting the specimen for his consideration. Dr. Priesner, replying under date of July 9, 1922, remarks on the very dark tibiae and antennae present in the species. He states "I do not know *nervosa* Hinds but it does not appear identical with *nervosa* Uzel which is but a variety of *tenuicornis* Uzel. A new name must very likely be given to *nervosa* Hinds, which is only known to me through its published description. If your specimen off *Casiope* is not identical with the species mentioned it is a new *species*."

I have in my collection a specimen of *nervosa* Uzel, taken from hay at Amherst, Massachusetts, U.S.A., determined by W. E. Hinds and a specimen of *tenuicornis* Uzel taken at Vienna, Austria, determined by H. Priesner. The species

nubila mihi is distinct and may be separated from *tenuicornis* by the following characters.

Antennal joints 3 and 4 distinctly pale, contrasting markedly with segments 2 and 5. Tibia and tarsi pale, femora lightly shaded brown ..... *tenuicornis* Uzel.

Antennal segment 3 light brown, segment 4 lighter but almost concolorous with segment 5. Femora and tibiae dark brown, almost concolorous with the body, tarsi pale. Wings shaded light brown except basal quarter and tip of scale ..... *nubila* mihi

Measurements: Head, length, .14 mm., width across occiput .18 mm.; prothorax, length .14 mm., width .22 mm. Total length of body about 1.3 mm.; of antennae .30 mm.; antennal lengths in microns:

Segment	*nubila*	*nervosa* (Hinds)	*tenuicornis* Uzel.
1	20	24	24
2	32	40	36
3	48	52	48
4	46	52	48
5	40	44	44
6	52	60	60
7	12	12	12
8	16	16	16

Color. Body uniformly dark brown. Antennal segments 1 and 2 dark brown, about concolorous with head; 3 light brown, about concolorous with tarsi; 4 to 8 dark brown. Legs, femora and tibiae dark brown almost concolorous with the body, fore tibiae slightly lighter than the middle and hind tibiae, especially towards the tarsi. Tarsi pale brown. Fore wings shaded light brown except basal quarter, scale light brown at base shading to cream at the tip.

Head. Slightly wider than long, about equal in length to the prothorax, with slight transverse striations across occiput; eyes, dorsally, about half the length of the head, sparsely pilose; ocelli three, conspicuous, posterior pair contiguous to the eyes but separated from each other by twice the distance between them and the anterior ocellus; frontal bristles conspicuous, greater than the width of the posterior ocellus; interocellar spines prominent, 52 microns, about equal in length to the postocular spine, 44 microns, which is also conspicuous; the two dorsal pairs of vertical bristles also conspicuous, subequal in length and comparable to the frontal bristles. Mouth cone not extending to the mesosternum, maxillary palpi 3-segmented, the two basal joints subequal and shorter than the apical. Antennae twice the length of the head, of normal structure, the short, stout spines on segment 2 being the most prominent.

Prothorax. Wider than long, equal in length to the head; spines normal to the genus, that in the anterior angle 80 microns in length, slightly longer than the one on the mid dorsal anterior margin, which is about 60 microns in length, but equal to the pair in the posterior angles. Legs with hind tibiae armed on the inside with 8 stout spines. Fore wings, first vein with 22 spines; second vein with 18 spines, each arranged in a continuous row, scale with 5, interior of scale one; anterior margin set with a double row of 25 spines. Hind wing

colorless, set with 25 delicate hairs on anterior margin, vein entire, without spines.

Abdomen. Normal in shape for the genus. The tenth abdominal segment split open above; the eighth with distinct lateral processes in the ♀ (♂ unknown), the posterior margin entire, not set with minute teeth except towards the sides.

Holotype. A single ♀ taken by the author off *Casiope*, a moss heather, at Lillooet, British Columbia, on July 24, 1917, at an elevation of 6,000 on Mt. McLean. No. 675 in the Canadian National Collection, Ottawa.

Taeniothrips orionis n. sp.

Female. Measurements. Head, length, .14 mm.; width across occiput .18 mm.; prothorax, length .18 mm., width .24 mm. Total length of body 1.6 mm. Antennal lengths in microns 36: 40: 76: 72: 52: 68: 8: 14.

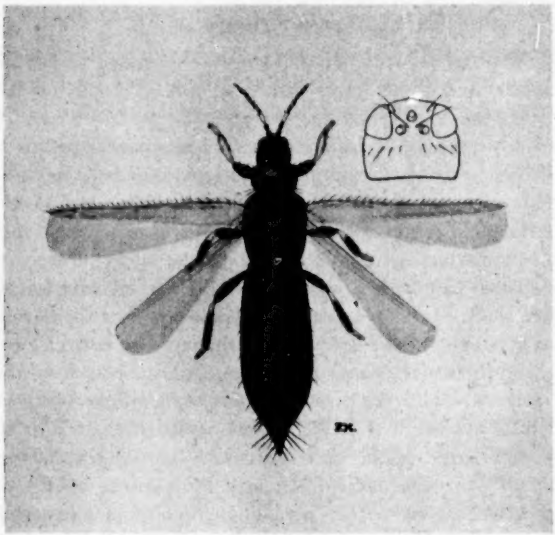
Color. Body uniformly dark brown. Antennal segments 1 and 2 dark brown, 3 light brown, 4 to 8 brown, intermediate in color between 1 and 3. Legs, all femora dark brown concolorous with body, fore tibiae and tarsi light brown, hind and middle tibiae dark brown except basal portion attached to femora which is light brown and concolorous with the hind and middle tarsi. Fore wings including scale uniformly shaded pale brown, somewhat lighter in color in the basal quarter; hind wings lightly shaded brown, somewhat darker towards the base than towards the apex with a prominent light brown vein throughout entire length.

Head. Slightly wider than long, about equal in length to the prothorax; occiput transversely striated; eyes prominent and protruding, which is accentuated by a marked depression at their base, pilose; ocelli three, set in an equilateral triangle on a raised portion of the vertex; frontal bristles conspicuous; interocellar spine set dorsal of a line drawn through the centres of the two posterior ocelli but placed between these ocelli, conspicuous and stout measuring 80 microns in length; two pairs of short vertical bristles placed behind each eye on the dorsal surface of the head, 20 microns in length, being about half the length of the frontal bristle; mouth cone short, not reaching to the posterior margin of the prothorax; maxillary palpi 3-segmented joints 20: 20: 24 microns, the apical slightly the longest; labial palpi 2-segmented, the basal joint very short, the outer 20 microns in length. Antennae of normal structure, the two joints of the style very short in comparison to the length of the other antennal segments.

Prothorax. Considerably wider than long; spines typical of the genus with only a short anteriorly-directed spine in the anterior angles, 32 microns in length, slightly shorter than the prominent mid-dorsal spine on the anterior margin which is 40 microns in length; the pair of prominent spines in the posterior angles present, the outer, 100 microns in length slightly the longer; the mid dorsal spine on the posterior margin measures 44 microns in length, remaining spines on this margin short and inconspicuous; a strongly chitinized indentation on the lateral margins. Legs, hind tibiae armed on the inside with 9 spines, the six apical ones being short and stout; tarsi also armed with spines. Fore wings, first vein set, in the holotype, with 10 to 12 spines. In ♀ paratype material from 9 to 12 spines are present. An examination of 16 wings shows an average of 11 spines arranged in groups as follows: 1-3-4-1-2. Hind vein with 13 spines evenly arranged from basal third to apex; scale 5, interior of scale one; the usual transparent area is present in the basal quarter; the anterior margin is set with 29-30

evenly arranged spines with interspaced hairs from basal third to apex, fringe moderately short and wavy; hind wings with anterior margin with 35-36 fine hairs, fringe moderately short and wavy, the prominent mid vein not set with spines.

Abdomen. Normal in shape, the ultimate segment split open above, the eighth with a fine comb on posterior margin with 34 teeth and with lateral processes distinguishable.



Taeniothrips orionis n. sp. Female enlarged and outline of head showing cephalic bristles.

Male. Lighter in color throughout than the ♀ and smaller. The prominent spines on the body are similar to those of the ♀ with the exception of those in the ultimate and penultimate abdominal segments.

Holotype. ♀, Lillooet, British Columbia, July 24 to 26, 1917 (R. C. Treherne), No. 678 in the Canadian National Collection, Ottawa. Off mountain lupine at elevation between 6000 to 7000 feet on Mt. McLean.

Allotype. ♂, same data.

Paratypes. 10 ♀ and 7 ♂, same data and taken also off *Heracleum lanatum* and in general sweeping.

This species is evidently allied to *T. pallipennis* Uzel but may be distinguished by its robust appearance, its greater length, the very strong bristles and the comparatively short joints of the style. The holotype and two paratypes were submitted to Dr. H. Priesner of Linz, Austria, for comparison with European species of *Taeniothrips* as they were not referable to any known species of American origin. I am indebted to Dr. Priesner for his kindness in expressing his belief that the species *T. orionis* had not been previously described.

Taeniothrips lemanis n. sp.

Measurements. Head, length, .13 mm., width across occiput .16 mm.;

prothorax, length .15 mm.; width, .22 mm. Total length of body 1.1 mm. Antennal lengths in microns 28: 40: 48: 52: 40: 56: 6: 10.

Color. Body uniformly light brown. Antennal segments concolorous with head except segment 3 which is pale brown. Legs, all femora and middle and hind tibiae concolorous with body, fore tibiae and all tarsi pale brown. Fore wings pale brown except basal quarter which is pale, scale pale brown at base, lighter at apex. Hind wings clear.

Head. Slightly wider than long, cheeks arched, occiput transversely striated, a pair of prominent though light colored spines on the sides of the ocellar triangle somewhat cepho-laterad of a line drawn between the anterior and posterior ocelli, 40 microns in length; postocular bristles 30 microns in length. Mouth cone of normal length, maxillary palpi 3-segmented, joints 20: 16: 20 microns; labial palpi 2-segmented, the basal joint very short, the apical 30 microns in length. Antennal normal in structure.

Prothorax. Wider than long with spines typically located for the genus, the pair in the posterior angles sub-equal, about 76 microns in length, the prominent pair on the posterior margin being equal in length to the inter-ocellar spine. The dorsal surface is lightly covered with about 24 small spines, the lateral margin with a chitinized indentation. Forewings, first vein set with 10 spines, arranged in groups 1, 3, 3, on basal half; hind vein with 14 to 15 evenly placed spines; costa with 27 spines. Hind wing with 29 delicate light colored spines on the costa. Scale 5, interior one. The clear transparent area on the basal quarter of the fore wing is not distinguishable.

Abdomen. Normal in shape, the tenth segment split open above, the eighth with a comb on posterior margin of at least 26 teeth and with lateral processes readily seen.

Holotype. ♀, Hatzic, B.C., April 22, 1917 (R. C. Treherne). No. 679 in the Canadian National Collection, Ottawa. Off buds of *Acer macrophyllum.*

Paratypes. 4 ♀, taken off cultivated pear buds at Haney, B.C.; off apple buds at New Westminster, B.C.; off *Nuttallia cerasiformis* at Mission City, B.C., during May, 1917, by the author.

The importance of this species lies in the fact that in the time of year it occurs and from its habitat it resembles the pear thrips, *T. inconsequens* Uzel. At the time of its capture it was referred to Mr. J. D. Hood, who pronounced upon it as probably a new species. Examination of more recent date proved the correction of this belief which in turn was supported by Dr. H. Priesner, Linz, Austria, to whom the holotype was submitted for comparison with European material. In the paratype material there are slight variations in the total number of spines on the first vein of the fore wing but the basal grouping of 1, 3, 3 remains constant. The body color of one of the specimens was also of a darker shade of brown than the holotype.

In conclusion I would like to express my deep appreciation for the assistance I have received, in determining the species in the foregoing list, from Dr. H. Priesner, Linz, Austria. Those species indicated by an asterisk were submitted to him for his corroboration and identification.

A NEW CHLOROPID SUBGENUS AND SPECIES FROM NEW YORK

BY O. A. JOHANNSEN,
Ithaca, N.Y.

The species falls in the couplet with *Melanochaeta* Bezzi in the keys of Becker, Enderlein, Malloch, et al, but owing to the peculiar elongate basal segment of the abdomen is at once distinguishable from all other species of the genus known to me. *Anatrichus* Loew, an African genus, has but two visible abdominal segments, but it differs in the form of the abdomen, structure of the arista, vestiture of the thorax and in other particulars.

Genus *Melanochaeta* Bezzi

Doliomyia nov. subg. Typus *D. longiventris* nov. sp.

Doliomyia longiventris n. sp.

Male. Frontal triangle large, sides slightly convex, black, highly polished, apex nearly reaching the base of the antennae, the apical third somewhat punctate; lower portion of the front subshining reddish yellow, upper part brownish; vertex, occiput, and buccae subshining black, finely punctate; vibrissae brown, small, but distinct; genae and face brown and finely punctate; antennae yellow, third segment nearly orbicular, angulate at the base of the arista; arista dark brown with its basal joiont over twice as long as wide, terminal joint with very close pubescence, though not so strongly as in *Crassiseta costata*; frontal hairs brownish, bristles of the vertex black. Thorax black; dorsum, including scutellum and the posterior part of the pleura finely and uniformly punctate, subshining; anterior part of the pleura glabrous, highly polished; hairs brown, bristles black; scutellum three-fourths as long as broad, with rounded margin and small marginal bristles. Abdomen black, subopaque, very finely punctate, parallel sided, as long as the head and thorax taken together, consisting apparently of but one segment (the fused first and second), the very minute terminal segments and the hypopygium being scarcely visible from above. Hypopygium small. Legs brownish yellow, not swollen; upper surface of the hind femora except the base, the fore tarsi and all of the tibiae except the base of the hind pair, dark brown; pulvilli large, white; claws black. Wings yellowish hyaline, veins brown, more yellowish toward the base; the costa with small bristles and ending at the tip of M_{1+2} slightly beyond the tip of the wing; R_1 ends nearly half way between the base of R_{2+3} and the radio-medial crossvein; the distance between crossveins is about one-third of the length of the last section of M_{1+2} and slightly less than the last section of M_3; R_{2+3} and M_3 end about equidistant from the base of the wing. Halteres white. Length 2.75 mm. Holotype, in the Cornell University collection.

Female. Like the male in structure and coloring, but the three terminal abdominal segments and the ovipositor are visible beyond the end of the elongate segment, the three terminal segments taken together measuring about one-eighth of the total length of the abdomen. Middle and hind tarsi more brownish. Two specimens, allotype and paratype, the former in the Cornell University collection, the latter in the collection of the U.S. National Museum.

The first specimen, a female, was taken in a cat-tail swamp near the golf links, Ithaca, N.Y., on April 12, 1921; the others were collected a year later in the same locality, April 16.

NEW CANADIAN EPHEMERIDAE WITH NOTES, II*

BY J. MCDUNNOUGH,

Ottawa, Ont.

The following paper is a continuation of the one which appeared in "The Canadian Entomologist" for February, 1922. Extensive collections of Ephemeridae made in various parts of the Dominion by officers of the Division of Systematic Entomology and other members of the Entomological Branch have proved that our Ephemerid fauna is a very rich one and contains, besides a large proportion of the already described species, a number of new forms, some of which are treated of in the present article.

Genus **Hexagenia** Walsh.

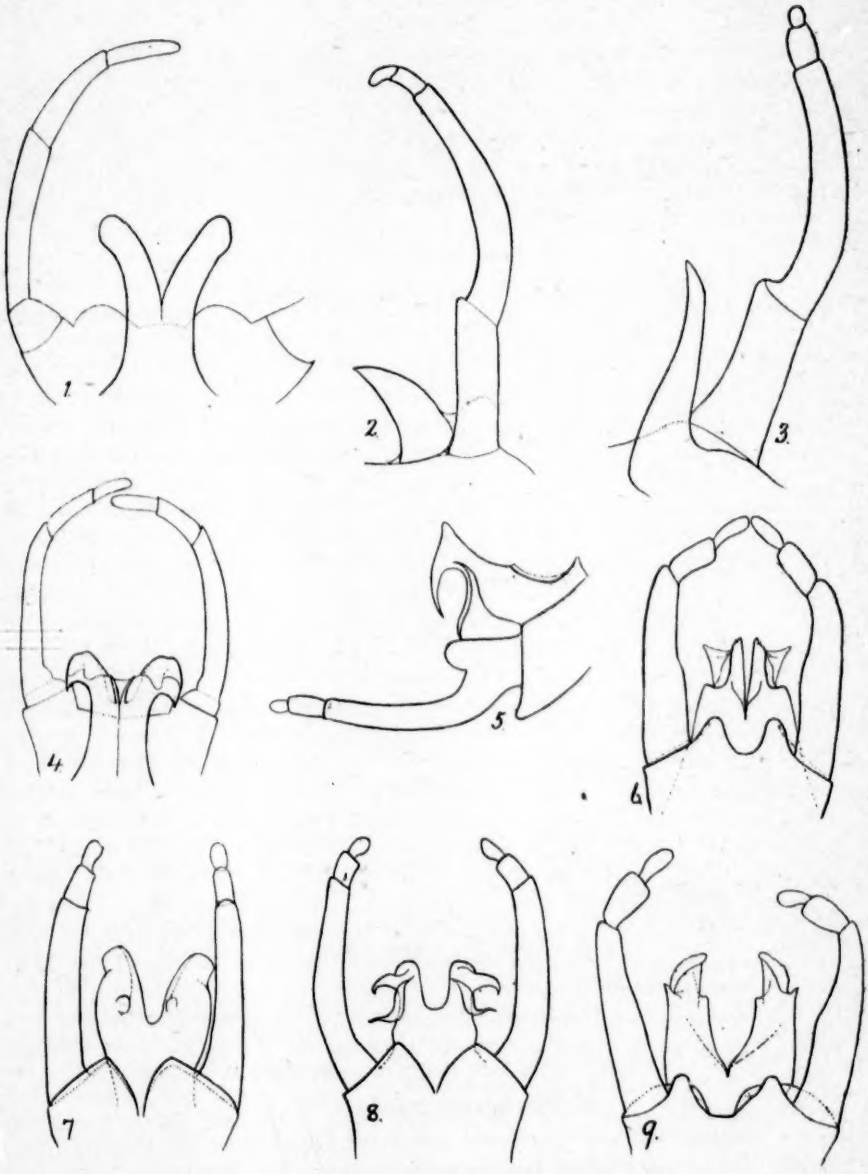
In the Archiv fur Naturgeschichte 1921, Jahrg. 87, Abt. A, pp. 233-9, Dr. Georg Ulmer has very satisfactorily cleared up the doubts which have always existed in the minds of North American students of Ephemeridae concerning the identity of *H. limbata* Guerin. From a study of type material he proves that the Serville and Pictet specimens belonged to the same species and that therefore the name *variabilis* Eaton (Monog. p. 55) has no valid standing. He further differentiates *limbata* Guerin and *bilineata* Say, giving figures of the ♂ genitalia and of the characteristic abdominal markings (figs. 4-7, pp. 236-7). With regard to *bilineata* it seems quite evident that Dr. Ulmer's idea of the species coincides with that of Walsh, who found the species very abundant at both Rock Island, Ill., and in the southern part of the State along the Ohio river. I have seen a number of specimens from this latter locality and they check up absolutely with the remarks of Walsh and Ulmer. For the present there seems no object to be gained in disputing this identification of Say's species. It must be noted, however, that Say's material came from the Minnesota (formerly St. Peter's) river and extensive collecting in this region will be necessary to prove that Walsh's and Ulmer's species occurs this far north; any Minnesota material I have examined, as well as much material in the Canadian National Collection from Southern Manitoba, belongs to *limbata* Guerin which is the common species apparently of the Canadian zone; the characteristic hooked penis, besides being figured by Ulmer as above mentioned, is depicted by Eaton in his monograph on Pl. VII, fig. 11c. From information furnished by Mr. Herbert Campion of the British Museum it seems certain that *angulata* Wlk. falls as a synonym of *limbata*; regarding *viridescens* Wlk. and *occulta* Wlk., based on subimagos, I have no information, but in view of the localities (Albany River, Lake Winnipeg) the reference to *limbata* seems fairly safe.

Besides *limbata* Guerin two other apparently undescribed *Hexagenia* species occur in Canada; these can be readily recognized by the male genitalia, although superficially very similar to *limbata*, and I describe them as follows:

Hexagenia rigida n. sp.

Male. Head yellow, suffused with ruddy brown on vertex; prothorax pale yellow with broad blackish lateral borders; meso- and metathorax light ruddy brown dorsally, tinged with yellow in posterior portion. Abdomen dorsally brown with a subdorsal series of pale yellow triangular patches situated on anterior

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa, Ont.



NEW CANADIAN EPHEMERIDAE

portion of each segment and pointing rearwards; a series of smaller similarly colored patches along the spiracular flange, and the posterior edge of each segment generally pale yellow; ventrally pale yellow with a series of brown oblique lateral stripes extending from the central area of one segment backwards to the middle of the lateral edge of the following segment; the posterior segments show traces of a medio-ventral brown line and large brown triangular blotches in median area. Forceps brown with second joint yellow; setae pale yellow, narrowly ringed with brown at joints. Fore legs ruddy brown with the basal portion of each tarsus tinged with yellow; other legs pale yellow with the last tarsal joint brownish. Wings hyaline with black-brown veins, costa tinged with light olive brown and with cross veins in this area heavily black, hind wings with faint brown border. In the genitalia the penes, instead of being hook-shaped as in *limbata*, are long and straight (fig. 3).

Female. Paler than the ♂ but in well-marked specimens with same type of maculation; often, however, specimens lack all ventral abdominal maculation and are then very difficult to distinguish from *limbata* females. As both species occur together the range of variation in the females of each species is hard to determine but apparently the longitudinal veins in the primaries of *limbata* are pale yellowish whiist in the present species they are blackish, at least in the apical half of the wing.

Holotype—♂, Orillia, Ont., July 21, (C. H. Curran); No. 690, in the Canadian National Collection, Ottawa.

Allotype—♀, Ottawa West, June 21, (C. B. Hutchings).

Paratypes—2 ♂, same data as holotype; 1 ♂, Kingston, Ont., July 26, (C. H. Curran); 6 ♂, Port Stanley, Ont., 1922 (H. G. Crawford); 2 ♂, 4 ♀, Ottawa West, June 21, (C. B. Hutchings); 3 ♂, 6 ♀, Britannia (near Ottawa) Ont., June 23, (G. Beaulieu); 1 ♂, Montreal, Que., June 25, (C. E. Petch); 1 ♂, Lanoraie, Que., June 9, (J. Beaulne); 1 ♂, 1 ♀, Lanoraie, Que., June, (C. E. Petch); 1 ♂, Winnipeg Beach, Man., July 10, (A. J. Hunter); all in the Canadian National Collection. 2 ♂, Grand Isle, Vt. (A. P. Moose), 2 ♂, Harrisburg, Pa., June 12, in the Collection of the Museum of Comparative Zoology, Cambridge, Mass.

The maculation and coloration of the abdomen is quite variable, the yellow tinge being frequently obscured by dull ruddy color, as in *limbata*, possibly due to conditions when drying. Often the ends of the lateral ventral stripes are connected by a short brown line, producing a continuous waved lateral stripe which seems characteristic for the species and which I have not seen in *limbata*; the setae are generally paler and with the dark rings narrower and better defined than in our Canadian *limbata*.

Eaton's figure (Monog. Pl. VII, fig. 11b) of genitalia, as *H. bilineata*, should probably be referred to this species.

Hexagenia atrocaudata n. sp.

Male. Very dark as compared with *limbata* and *rigida*, all the venation of the wings blackish, the costa heavily tinged with brown in the apical half and between veins 2 and 3 in the basal half and with a distinct purple-brown border to the secondaries. Prothorax blackish, slightly paler centrally; mesothorax dark olivaceous brown, shaded with paler anteriorly. Abdomen dorsally dark black

brown with an indistinct paler, olivaceous, medio-dorsal band on segments 3-6, this color fading out entirely on the posterior segments; a lateral series of olivaceous triangular patches, based on the anterior edge of each segment and similarly colored small patches along the spiracular flange in posterior portion of segment, generally separated from the anterior triangles by an oblique band of dark color. The triangular dorsal portion of segment 10 is dull brown, edged with black and with geminate black medio-dorsal streaks; base of setae yellow, setae themselves deep blackish with very narrow brown intersegmental rings. Ventrally the abdomen is dull olivaceous yellow with a triangular brown patch occupying a large portion of each segment, the posterior edge of segment forming the base and the sides ascending obliquely forward to a point on the medio-anterior edge, thus leaving only lateral triangles of the yellow ground color visible. Forelegs deep blackish, other legs greenish yellow with tarsi partially blackish.

The genitalia, figured from a dried specimen (fig. 2), possess a very characteristic penis; this is short, broad and bluntly pointed, not hooked as in *limbata* nor straight and narrow as in *rigida*. Length of body 22 mm.; of forewing, 20 mm.

Female. Slightly paler than the ♂, but very similar; head marked with bright orange yellow behind the ocelli and on posterior edge of vertex, next to each eye.

Holotype— ♂, Ottawa, Ont., Sept. 10 (F. P. Ide); No. 691, in the Canadian National Collection, Ottawa.

Allotype— ♀, Ottawa, Ont., Aug. 25 (F. P. Ide).

Paratype— 1 ♀, Ottawa, Ont., Sept. 10, (F. P. Ide), in the Canadian National Collection; 2 ♂, Straight Creek, Lee Co., Va., Aug. 8, in the Coll. Museum of Comparative Zoology, Cambridge, Mass.

This species occurs later in the season than the other allied species; up to the present it has only been seen in late summer on the Rideau river. The two males from Virginia were received with other material in the genus, sent for study by Dr. N. Banks; they had been examined by Eaton and placed by him in *bilineata* but they agree so well in all respects with the type specimen of *atrocaudata* that I have no hesitation in making them paratypes. The range of the species is thus considerably extended; it will probably occur all through the Alleghenian zone.

Leptophlebia heteronea n. sp.

Male. Head and thorax deep blackish, shiny; abdomen dorsally with segment 2 largely smoky brown, slightly paler anteriorly; segments 3-6 hyaline white with broad brown banding on posterior section, leaving a narow white posterior edge to each segment; the band on segment 3 occupies about half the dorsal area, on 4 and 5 about one-third and on 6 two-thirds; segments 7 to 10 deep brown with narrow whitish area on anterior margin of 7, especially laterally; ventrally segments 2-7 are white with segment 2 largely tinged with dull brownish and with large, ruddy, diamond-shaped medio-ventral blotches on segments 3-7, increasing in size towards the rear so that on 7 the blotch occupies the larger portion of the ventral area; posterior segments dull brown with whitish forceps. Setae white; tracheae in spiracular area marked with black. Fore legs dull brownish with whitish tarsi; two rear pairs with light brown femora and whitish tibiae and tarsi,

the former tipped with brown proximally. Wings hyaline white; veins pale, except longitudinal costal ones which are tinged with brown.

Female. More or less unicolorous blackish-brown with some slight ruddy tinges on head and abdomen, the ventral portion of which is paler than the dorsum; legs as in male but the tarsi are not so distinctly white, being tinged with brownish. Wings hyaline white with most of the longitudinal veins slightly (costal strongly) brown-tinged. Length of body, 5-6 mm.; of fore-wing 6-7 mm.

Holotype—♂, Waterton Lakes, Alta., July 24, (J. McDunnough); No. 685, in the Canadian National Collection, Ottawa.

Allotype—♀, same locality and collector, July 23.

Paratypes—30 ♂, 12 ♀, same locality and collector, July 21-26.

A figure of the male genitalia is given; it is probably this species which is recorded by Dodds (Trans. Am. Ent. Soc., 1923, 104) from Colorado under the name *pallipes* Hag. which was described from a single female from Truckee, Calif., with pale whitish legs. The females of our Waterton species certainly do not agree in this respect but a single ♀ is before me from Oliver, Okanagan Valley, B.C., which has the pale legs as described; I am holding this specimen under the name *pallipes*. Several specimens from Banff, Alta., and Nordegg, Alta., in the Canadian National Collection are rather larger in size and the abdominal brown bands of segments 3-6 extend across the ventral side. As, however, the male genitalia (fig. 9) appear to be essentially the same, I presume that these slight differences cannot be regarded as specific.

Leptophlebia moerens n. sp.

Head and thorax shiny blackish; abdomen dorsally with segment 2 dull, semitranslucent brownish, segments 3-6 dull whitish translucent, with narrow brown bands on posterior margin and with segment 3 shaded with brown; laterally above the spiracular line is a broken brown line, generally limited to an obsolescent patch on the anterior portion and a larger, deeper colored spot on the posterior margin of each segment. Segments 7-10 deep shiny brown. Ventrally segments 2-7 whitish with the usual medio-ventral, diamond shaped, brown patches, that on segment 7 occupying the greater part of the segment; segment 2 shaded with smoky brown; posterior segments dull brown, slightly paler than the corresponding dorsal portion and less shiny. Forceps dull brownish white; setae white. Legs light brown with all the tarsi whitish. Wings hyaline with pale veins. Length of body 6 mm.; length of forewing 6 mm.

Holotype—♂, Ottawa Golf Club (near Hull) Que., June 10, (J. McDunnough); No. 686, in the Canadian National Collection, Ottawa.

Paratype—♂, same locality, June 11, (R. Ozburn).

Readily recognized by the striking male genitalia (fig. 5) with the excavated basal joint of forceps and long thin appendages to the penes.

I have before me 4 females (2 from Ottawa Golf Club, 2 from Cascades, Gatineau River, Que.) which may belong to this species; they differ from the females of the following species in having brown legs and dark veins to the primaries with a faint brownish tinge to the wing. The excavation of the posterior ventral segment is broadly triangular, the two lobes and the triangular excavation being practically equal in size.

Leptophlebia mollis Eaton

The type of this species was restricted by Ulmer (Archiv fur Naturg., Vol. 87, Heft 6, pp. 254-6) to the specimen in the Selys-Longchamps collection, originally collected by Fitch in the vicinity of New York City. I have recently examined two specimens of Fitch's original series contained in the United States National Museum and a further specimen from the Catskill Mountains, N. Y. There are also specimens in the Canadian National Collection from Covey Hill, Que., and from the Ottawa region. As Ulmer's figure of the male genitalia is evidently drawn from a dried specimen and is not entirely accurate I give a figure (fig. 6) of these parts, drawn from a permanent slide, made after removing the abdomen and treating it with caustic potash; in this group it is the only method which will insure accurate knowledge of these delicate parts.

Leptophlebia guttata n. sp.

Male. Remarkably similar superficially to *mollis* but the white of the abdomen is slightly soiled with brownish and there is a distinct lateral row of black dots in the spiracular area, one dot on the posterior edge of each segment. The color of the posterior segments is deep black-brown and segment 8, ventrally is also brown. The legs are tinged with brownish and there is a distinct dark spot at the junction of femur and tibia on all legs. The forceps are tinged with brown apically and the genitalia (fig. 8) is remarkably distinct from that of *mollis* and more closely related to that of *moerens*.

Holotype—♂, Covey Hill, Que., June 25, (C. H. Curran); No. 688, in the Canadian National Collection, Ottawa.

Paratype—♂, same data.

Leptophlebia volitans n. sp.

Male. Thorax shiny blackish; abdomen dorsally with segment 2 deep brown, segments 3-7 hyaline white with 7 more or less tinged with brown and with narrow brown bands on posterior edges of segments; a series of short, lateral, longitudinal, blackish dashes above the spiracular line, each dash on the posterior portion of segment; segments 8-10 deep black-brown. Ventrally the first seven abdominal segments are hyaline white with the medio-ventral diamond patches faintly outlined in ruddy-brown and segment 2 faintly shaded with brown; the posterior segments are lighter brown than the dorsal portions and the forceps, including their base, white. Setae white; legs dull whitish. Wings hyaline with pale venation. Length of body 5 mm., of forewing 5-6 mm.

Holotype—♂, Ottawa Golf Club, Que., July 26, (R. Ozburn), No. 689, in the Canadian National Collection, Ottawa.

Paratypes—9 ♂, same data; 1 ♂, Algonquin Park, Ont., July 30, (J. McDunnough).

The species is readily recognized by the male genitalia (fig. 7).

Centroptilum rufostrigatum n. sp.

Male. Face, thorax, and sternum deep black-brown with rear portion of mesothorax and the lateral sutures tinged with pale yellowish brown; abdomen with segments 2-6 paler yellowish white, hyaline, with a sublateral row of four minute red transverse dashes on each side, each dash situated on the intersegmental suture; segments 7-10 deep chocolate brown dorsally, alabaster white ventrally, the division between the two colors sharply defiined by the spiracular

flange; on the pale abdominal segments this is marked by a faint, broken, slightly curved, black hair-line. Forceps and setae white; legs pale yellowish white. Wings hyaline, primaries with single intercalaries, secondaries long, narrow, with two longitudinal veins. Length of body 4.5-5 mm.; of fore-wing 5 mm.

Holotype— ♂, Aweme, Man., Sept. 30, (R. M. White); No. 676, in the Canadian National Collection.

Paratypes—10 ♂s, same data as type: 3 ♂, Aweme, Man., Sept. 8, (N. Criddle); 2 ♂, Treesbank Man., Sept. 27, (R. H. White); in the Canadian National Collection.

There is a tendency for the markings on the pale abdominal segments to become obsolete in some specimens, but generally sufficient trace of the red subdorsal dashes may be found to determine the species, especially when a strong light is used. Judging by Eaton's description this species must fall near *luteolum* Mull, a European species not known to me in nature. It appears, however, to be considerably larger than *rufostrigatum*.

Centroptilum bifurcatum n. sp.

Male. Head and basal half of antennae blackish; thorax deep olive-brown with a pale yellow line extending forward from base of primaries along lateral edge of mesonotum where it ends in a small round yellowish patch; lateral sutures and rear edge of mesothorax tinged with yellowish; abdomen with segment 2-6 pale yellowish white, hyaline, with a faint ruddy broken dorsal hair line and traces of ruddy shading on the posterior portion of segments 2-4, reaching to the spiracular flange; segments 7-9 deep chocolate brown dorsally with segment 10 pale yellowish, ventrally segments 7-10 are alabaster white with the forceps and setae also whitish. A faint, broken, dark line on pale segments along spiracular area. Legs pale yellowish white, femora rather deeper in color than other portions. Wings hyaline, primaries with single intercalaries, secondaries broader than usual, (twice the width of preceding species), with two longitudinal veins the lower of which is faintly forked near its apex. Length of body 5 mm.; of forewing 5 mm.

Holotype— ♂, Waterton Lakes, Alta., July 23, (J. McDunnough); No. 677, in the Canadian National Collection.

This species superficially resembles the preceding but is easily separated by the size and the venation of the secondaries.

Centroptilum bellum n. sp.

Male. Head and antennae dull blackish, eyes (dried) deep reddish; prothorax shaded with deep olive-brown, mesothorax olivaceous with variable amount of yellowish subdorsal shading, rear dorsal and lateral areas tinged with ruddy; metathorax deep olive-brown, (darker than mesothorax) with darker sutures and anterior ruddy shade dorsally. Abdomen with segments 2-6 pale yellowish, semi-hyaline, with narow ruddy-brown band on posterior margin of each segment extending to spiracular area and ending in a faint small ruddy patch, below which is a broken, blackish spiracular line. Segments 7-10 dorsally bright ruddy brown, ventrally light, opaque yellow with ruddy lateral shading and faint traces of intersegmental ruddy lines which are wanting entirely on segments 2-6. Forceps and legs yellowish white, setae white. Wings hyaline, primaries with single

intercalaries, secondaries moderately broad with two longitudinal veins. Length of body 5 mm.; of forewing 6 mm.

Female. Head yellow, marked with ruddy centro-dorsally; thorax much as in male; abdomen dorsally dull olivaceous tinged with ruddy on posterior segments and with ruddy-brown band on segmental incisures; ventrally pale yellow.

Holotype— ♂, Broadview, (vicinity of Hull), Que., July 16, (R. Ozburn); No. 680, in the Canadian National Collection.

Allotype— ♀, Ottawa Golf Club, (vicinity of Hull), Que., July 16, (R. Ozburn).

Paratype—1 ♂. Aylmer, Que., July 17, (R. Ozburn).

The paratype shows considerably more yellow shading on the thorax than does the type; in fresh material the dorsal portion of the ♀ abdomen may differ from the description; the single specimen before me is rather discolored in this region by the underlying egg-masses. All the localities given are along the Ottawa river, a few miles west of Ottawa.

Centroptilum ozburni n. sp.

Male. Head and antennae blackish, the latter tipped with white; thorax unicolorous deep blackish dorsally, the lateral and sternal areas slightly more brownish and the anterior edge of mesosternum tipped with pale ochreous.

Abdomen with segments 2-6 hyaline white with traces of an interrupted geminate brown dorsal line and with the posterior edges of these segments narrowly banded with chocolate-brown, which color scarcely attains the spiracular area; segments 7-10 chocolate-brown dorsally, alabaster white ventrally; there are very faint traces of brown bands on the posterior edge of all segments ventrally, most markedly on segments 5 and 6; spiracular area marked with a blackish line. Forceps and setae white, legs whitish with traces of a ruddy band across middle of femora. Wings hyaline. Secondaries long, narrow, with the usual two longitudinal veins.

Female. Front yellow with three vertical ruddy-brown lines; thorax dull olivaceous with sutures somewhat marked in yellowish; abdomen (as far as can be determined in discolored specimens) yellowish dorsally on anterior six segments with dorsal brown patches and lateral brown triangular patches on anterior portion of each segment; the rear segments are probably dull brown; ventrally dull greenish yellow. Legs as in male. Length of body 4 mm.; of forewing 4.5-5 mm.

Holotype— ♂, Ottawa Golf Club, Que., July 16, (R. Ozburn); No. 681, in the Canadian National Collection, Ottawa.

Allotype— ♀, Broadview (near Hull), Que., July 16, (R. Ozburn).

Paratypes—5 ♂, 2 ♀, same data as Allotype.

Distinguished easily from *bellum* by the dark thorax in ♂ and the deeper brown color of the rear abdominal segments. It is also deeper in color than *fragile* McD. and the abdominal banding is much more pronounced.

Centroptilum simile n. sp.

Male. Very similar to the preceding species in size and maculation; the blackish thorax, however, shows a distinct pale yellow-brown lateral edge to the

mesonotum; the pale abdominal segments 2-6, besides being ringed posteriorly with ruddier brown than in *ozburni*, are shaded with paler ruddy brown over the posterior third of each segment, this color extending forward laterally, above the black spiracular line, to nearly the anterior edge; the brown of segments 7-10 is much ruddier, and ventrally segments 8 and 9 are much tinged with the same color. The legs, especially the fore legs, are deeper in color with ruddy marks at base, middle and apex of femora, these marks being connected by a dark hair-line.

Female. Shows the same ruddier color as compared with same sex of *ozburni*; the front is deep yellow with entire central area brown-shaded; the prothorax is pale olivaceous, edged with ruddy-brown and with a geminate mediodorsal ruddy line. The anterior segments of the abdomen are discolored but the posterior five are dull ruddy-brown dorsally. Ventrally all abdominal segments are dull dirty white, tinged with ruddy on posterior three and with traces of intersegmental banding, most noticeable laterally.

Holotype— ♂, Covey Hill, Que., June 25, (C. H. Curran); No. 682, in the Canadian National Collection, Ottawa.

Allotype— ♀, same data.

Centroptilum infrequens n. sp.

Female. Thorax light ochreous, shaded with creamy; abdomen pale yellowish with a broad stripe extending its whole length dorsally, last three segments opaque, others semihyaline; setae white; legs pale yellow; wings hyaline with pale veins; hind wings long and very narrow, the longitudinal veins united at base for a short distance and after forking running close to each other to beyond costal projection which is long and hook-like. Length of body 7 mm.; forewing 8 mm.

Holotype— ♀, Winnipeg Beach, Man., July 10, (A. T. Hunter); No. 695 in the Canadian National Collection.

The large size and prominent ruddy dorsal stripe readily distinguish the species which I venture on this account to describe from a single ♀.

(To be Continued)

Mailed April 5th, 1924